Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 1999		**00-00-1999 to 00-00-1999**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Modeling Coastal Ocean Optical Properties for Coupled Circulation and Ecosystem Models	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **University of California at Santa Barbara,ICESS & Dept. of Geography,Santa Barbara,CA,93106**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a REPORT **unclassified**	b ABSTRACT **unclassified**	c THIS PAGE **unclassified**	**Same as Report (SAR)**	**2**	

Modeling Coastal Ocean Optical Properties for Coupled Circulation and Ecosystem Models

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LONG-TERM GOAL

The overall goal of this work is to make use of existing data for the full spectral modeling of Case 2 waters. We will use of a version of Hydrolight tailored for use in coupled physical-biological-optical ecosystem models, and then to utilize these models for understanding the coastal ocean optical environment.

OBJECTIVES

Our primary objectives include tailoring the Hydrolight ocean optical model for inclusion in coupled ecosystem models and the evaluation and development of new simplified models. In particular these models will be tested making us of existing data for Case 2 waters. One objective for this year's work was to evaluate the QA/QC for these data and to produce an internally consistent and wide ranging set of Case 2 observations for model testing.

APPROACH

Our approach is to test and evaluate these models across a wide range of Case 2 waters influenced by both biogenous and terrigenous variability. The data needed for testing these models are available from the Plumes and Blooms data set (http://www.icess.ucsb.edu/PnB/PnB.html) taken in Santa Barbara Channel and in Monterey Bay. Within these regions, surface waters from several sources driven by temporally variable processes are mixed in varying proportions. These waters include nutrient-rich, upwelled water from north of Point Conception and warmer, saltier waters from the Southern California bight to the south. These contrasting waters provide a full range of nutrient, hence phytoplankton, concentrations. In addition, these waters are subjected to episodic weak to very strong pulses of terrigenous input, where nearshore sediments resuspended by wave activity commingle with sediment plumes washed out by heavy rain to create a complex physical & optical environment.

This work is being done in collaboration with Dr. Curtis Mobley and Dr. Lydia Sundman of Sequoia Scientific who are co-funded with me to develop and extremely fast version of Hydrolight for applications using these data and models.

WORK COMPLETED

This year's work has focused on optimization of Hydrolight (see Mobley) and on producing an internally consistent and wide ranging set of Case 2 observations for model testing.

RESULTS

A special version of Hydrolight 4.0 (see Mobley) has been developed for use in coupled ecosystem models that is significantly faster than the standard code. Our SBB data are being used to test both this special version, with comparison with the original version, as well as for internal consistency of the observed data.

IMPACT/APPLICATION

This work will provide an accurate, optimized, and fully tested radiative transfer model for coastal (Case 2) waters. In turn, this model will provide a means of remotely and accurately estimating optical properties in these waters and provide a solid theoretical basis for developing accurate proxy measures of important parameters within these waters. Further, these results will significantly advance our ability to optically model Case 2 waters and provide important input to coupled physical and ecological models.

TRANSITIONS

Beta-test versions of the optimized Hydrolight 4.0 code have been delivered to us by Drs. Mobley and Sundman. We are working with them to test this version with our data.

RELATED PROJECTS

The Plumes and Bloomes program continues to obtain bio-optical data within Santa Barbara Channel.